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09/357,507	07/20/1999	KIYOSHI TAGUCHI	10059-286	9338

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EXAMINER

VARCOE JR, FREDERICK T

ART UNIT	PAPER NUMBER
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1764

11

DATE MAILED: 04/22/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/357,507

Applicant(s)

Taguchi et al.

Examiner

Varcoe

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on Jan 18, 2002

2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 35 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) 1, 3, 4, 6, 8-17, and 19 is/are pending in the application.

4a) Of the above, claim(s) _____ is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) 1, 3, 4, 6, 8-17, and 19 is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claims _____ are subject to restriction and/or election requirements.

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved.

12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

13) ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

a) ☐ All b) ☐ Some* c) ☐ None of:

1. ☐ Certified copies of the priority documents have been received.

2. ☐ Certified copies of the priority documents have been received in Application No. _____.

3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

*See the attached detailed Office action for a list of the certified copies not received.

14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

15) ☐ Notice of References Cited (PTO-892)

18) ☐ Interview Summary (PTO-413) Paper No(s). _____

16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

19) ☐ Notice of Informal Patent Application (PTO-152)

17) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s). _____

20) ☐ Other: _____

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DETAILED ACTION

Response to Amendment

1. The amendment filed January 18, 2002, has been received and carefully considered. The drawing changes submitted on January 18, 2002, are acceptable. The objections to the Specification and drawings have been withdrawn. The claim rejections have been withdrawn. The 35 U.S.C. §112 claim rejections have been withdrawn. Claims 1, 3, 4, 6, 8-17 and 19 remain active.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

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4. Claims 1, 6 and ⁸⁻¹⁷⁴¹⁹~~8-19~~ are rejected under 35 U.S.C. 103(a) as being unpatentable over Heil et al., U.S. Patent No. 5,874,051.

With regard to claim 1, Heil discloses a hydrogen purifying apparatus for oxidizing and removing carbon monoxide in a reformed gas containing carbon monoxide in addition to the main component of hydrogen gas, the apparatus comprising a reaction segment (Figure 1 (5)) having a catalyst bed for oxidizing carbon monoxide, a reformed gas inlet (2) for supplying the reformed gas to the reaction segment via a reformed gas pathway, and an oxidant gas supplying segment (3) for supplying an oxidant gas to the reformed gas supply pathway.

Heil discloses a water-cooled apparatus (Heil Figure 1 (6)) for cooling the upstream side of the catalyst side.

“Means for heating” invokes paragraph 6 of 35 U.S.C. 112. The specification at page 12 recites “a heater as the means for heating the downstream side of the catalyst layer.” Page 16 lines 16-20 recite an electric heater, or alternatively, a heater using oxidation heat generated by CO and hydrogen, as the heating means for heating the catalyst layer at the downstream side. Heil discloses exothermic CO oxidation along the reactor path as a means for heating (Heil Abstract).

Claim 1 further recites means for heating selected from the group consisting of a portion of the reformed gas in conjunction with a heat exchanger, and an electric heater. The apparatus of Heil does not explicitly disclose heating using an electric heater or the hot reformed gas from

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the reformer. Heil does, however, discuss adjusting the temperature in the CO reactor to achieve practically any desired temperature profile along the flow path (Heil column 6 lines 51-57). Heil uses a heat exchanger with heat exchange fluid to accomplish this control.

At the time of the invention it would have been obvious to one skilled in the art to use the hot reformer effluent in the heat exchanger of Heil to accomplish temperature control in the down-stream portions of Heil's CO oxidizer unit. This amounts to an obvious substitution of one heat exchange fluid for another. The motivation would have been to control exothermal CO oxidation along the reactor path (Heil Abstract) using an available heat exchange fluid.

With regard to claim 6, Heil discloses supplying an amount of oxidant gas that changes in response to the temperature of the catalyst layer (column 4 lines 28-49). Heil discloses a control valve capable of changing an amount of oxidant gas (Figure 1 (4)). How that flow varies is an intended use and does not patentably distinguish the invention from the prior art.

With regard to claim 8, Heil discloses passing the reformed gas through the catalyst layer in a second direction (Figure 1). Heil also discloses passing the heat exchange fluid through the apparatus (Figure 1 (6)). The direction of flow is an intended use and does not patentably distinguish the invention from the prior art.

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With regard to claim 9, Figure 1 of Heil discloses the reaction segment placed outside the reformed gas pathway before passing through the catalyst bed (Figure 1).

With regard to claim 10, Heil discloses a reaction segment that is tube-shaped and where the flow pathway of the gas before passage in contact with the catalyst is formed around the reaction segment (Figure 1).

With regard to claim 11, it would have been obvious to place multiple parts of the modified apparatus of Heil in parallel. The motivation would have been to permit one part to fail without affecting the performance of other, parallel, parts of the apparatus.

With regard to claim 12, Heil discloses a hydrogen purifying apparatus wherein there are a plurality of branches that supply gas from a reformed gas supply pathway and an oxidant gas supply. There is one such branch at the entrance to each unit of Heil's apparatus. At least one branch (the "catalyst layer heating branch") is connected at the middle point of the catalyst layer (since Heil has multiple catalyst portions, the middle point is that point where there are as many portions upstream as there are downstream), while there is another branch (the "catalyst layer cooling branch") that is connected to a unit upstream of the middle point.

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Heil discloses essentially the same apparatus as the present claim but fails expressly to disclose a branched pathway formed by a bifurcation downstream from a connection between the reformed gas supply and the oxidant gas supply.

At the time of the invention it would have been obvious to one skilled in the art to split the flow path downstream from a connection between the reformed gas supply and the oxidant gas supply in order to supply a group of existing of the catalyst portions.

The motivation would have been to supply each of the portions with a gas mixture for processing and to enable further controlling the exothermal CO oxidation along the reactor path (Heil Abstract).

With regard to claim 13, "means for changing" invokes paragraph 6 of 35 U.S.C. 112. The specification at page 26 line 17 recites "means for changing the cross-sectional areas ...in order to control the volume..." The specification at page 35 line 9 recites "branched volume control segment 107." These appear to be references to a valve. Heil discloses valves (4) used for changing the cross-sectional area of the reformed gas pathway and the branched pathway in order to control the amount of gas supplied to the reaction segment.

With regard to claim 14, Heil discloses a reaction segment with at least a two-segmented catalyst layer and at least the uppermost catalyst layer having a part with no catalytic function or a part with low reactivity to CO (Heil column 4 lines 2-5).

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With regard to claim 15, Heil discloses a catalyst layer composed of catalyst pellets (column 3 lines 40-47) and metal support units. It is well known in the art to form metal support units for catalysts into honeycomb shapes.

With regard to claim 16, Heil discloses multiple catalyst segments (Figure 1). Lacking a showing of criticality, the relative sizes of parts of the layers is merely an obvious design choice.

With regard to claim 17, Heil discloses catalyst layers comprising a platinum group metal supported by an alumina material and a platinum group supported by a zeolite (column 53 lines 39-41).

With regard to claim 18, Heil discloses an uppermost catalyst layer heated to a higher temperature than the lowermost catalyst layer (column 1 lines 50-57).

With regard to claim 19, "means for controlling" in line 4 invokes paragraph 6 of 35 U.S.C. 112. The specification at page 30 lines 20-21 recites "... controlling the volume of oxidant gas..." Heil discloses means for controlling the supply of oxidant gas (Figure 1 (4)).

Heil discloses controlling the temperature in the system to achieve a desired temperature profile (column 6 lines 51-56) using metering devices controlled by a central control device (column 4

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lines 45-49). Although temperature measuring apparatus is not explicitly mentioned, it is inherent in temperature control apparatus as described by Heil.

5. Claims 3 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Heil et al., U.S. Patent No. 5,874,051 as applied to claims 1 and 2 above, in view of Trocciola et al. U.S. Patent No. 5,330,727.

With regard to claim 3, the apparatus of Heil is essentially the same as that of the instant claim but fails expressly to include catalyst layers formed of different catalyst materials.

Trocciola discloses operating two different catalyst beds under different conditions that lead to different performance results (column 6 lines 1-36).

At the time of the invention it would have been obvious to one skilled in the art that getting different results from two different catalyst beds might best be accomplished by using two different types of catalyst materials. A variety of appropriate catalyst materials are available (Trocciola column 5 lines 4-10).

The motivation would have been to take advantage of the differences in the catalyst materials. Trocciola discloses operating the downstream catalyst at a lower temperature than the upstream catalyst (column 6 lines 1-36).

With regard to claim 4, Heil discloses using metallic support material for the catalyst (column 3 line 43).

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Response to Arguments

6. Applicant's arguments filed January 18, 2002, have been fully considered but they are not persuasive.

With regard to claim 1, Applicant argues that Heil does not teach that heat supplied to the CO reactor can be generated outside the CO reactor. Examiner replies that Heil discloses a heat exchanger that regulates the temperature of the catalyst by means of a heat exchange fluid. This is a structural feature. Whether the heat exchange fluid supplies heat or withdraws heat is a feature of the method of operation and is not a structural feature of the apparatus. In the apparatus of Heil, as well as that of the present invention, the temperature can be readily controlled and thus the operation can be conducted stably.

With regard to claim 6, Applicant argues that since Heil does not teach varying the supply of oxidant with catalyst temperature, Heil's apparatus is distinct from that of the present invention. Examiner notes that the present claims recite a valve for capable of changing the amount of oxidant gas to be supplied. Heil's valve has the same capability. How that capability is used, for example controlling in response to temperature, is a method of operation and does not patentably distinguish over the prior art.

With regard to claim 9, it is not clear how Heil's reaction chamber differs from Applicant's reaction segment. Each part of Heil's apparatus that is distinguishable from another part could be considered a segment. Applicant states that Heil does not disclose that the gas is

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supplied to its catalyst units after passing through a cooling means. Since Heil has cooling means (Figure 1 (6) and (8)) that precede the catalyst in subsequent parts (II and III) of the system, Heil does disclose cooling prior to contact with the catalyst.

With regard to claim 3, Applicant argues that Trocciola does not describe the catalyst in the upstream layer as being formed from different material from the catalyst in the downstream layer. While this is true, nevertheless, with a variety of suitable materials available (Trocciola column 5 lines 4-10), and different conditions required in the two catalyst beds, including different temperatures, choosing different materials is an obvious way to facilitate operation under the two different sets of conditions in the two different catalyst beds.

With regard to claim 14, Applicant's arguments are not convincing. Heil discloses the additional parts of the present claim. A catalyst part that has no catalytic function can refer to many of the parts of Heil's system. Any part of the system lacking catalytic function could be called a catalyst with no catalyst function. Any bed with measurable height could be considered as having an upper and a lower portion. The benefits described by Applicant deriving from the present invention are performance features and not structural features. Thus, they do not structurally distinguish Heil's apparatus from that of the present claims.

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Conclusion

7. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rick Varcoe, whose telephone number is (703) 306-5477. The examiner can normally be reached Monday through Friday from 9:00 am to 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Marian Knode, can be reached on (703) 308-4311.

The FAX telephone number for this Group Art Unit is (703) 305-3599 (for Official papers after Final), (703) 305-5408 (for other Official papers) and (703) 305-6357 (for Unofficial papers).

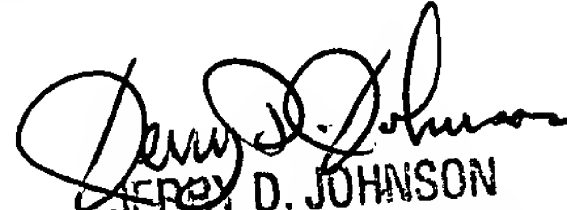
When filing a FAX in Group 1700, please indicate in the Header (upper right) "Official" for papers that are to be entered into the file, and "Unofficial" for draft documents and other communications with the PTO that are not for entry into the file of the application. This will expedite processing your papers.

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Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 308-0661.


JERRY D. JOHNSON
PRIMARY EXAMINER
GROUP 1100

RV
April 17, 2002